regards the accuracy of the construction of these chronographs, the best criterion is to be found in the force that is required to work them. We find that 7 foot-pounds per hour drives the clock-work and pendulum; 7 foot-pounds more drives the carriage as well; and only 3 foot-pounds more is wanted for the cylinder—17 foot-pounds per hour for the whole instrument. Considering the resistance of the carriage, the resistance of the glycerine, and the weight of the cylinder, we think the result as surprising as it is satisfactory.

THE BELGIAN ENTOMOLOGICAL SOCIETY

IN April, 1855, a circular with ten signatures was addressed to entomologists residing in Belgium, proposing the formation of a National Entomological Society, the students of Insecta and allies having at that time no organisation, no central meeting-place for interchange of ideas, no special medium in which to publish the results of their researches. The proposal was met by cordial approval, and the first volume of the *Annales* of the newly-formed Society, published in 1857, indicated a strength of forty-seven effective and four honorary members, with Baron de Selys-Longchamps as president. At first its publications were occupied almost entirely by subjects concerning the Belgian fauna, the volumes were thin, and each represented the work of more than one year. The Society was however well grounded, and notwithstanding occasional short periods of depression, it gradually increased in the number of its members, in the wideness of the scope of the papers read at its meetings, and in reputation as one of the leading entomological societies. Naturally the size of the volumes of the *Annales*, and the frequency of their appearance, also increased, and now the Society produces a volume each year that no similar society need be ashamed of. The twenty-second volume appeared in 1879, showing that the weakness inherent on infancy was soon overcome. The list in this volume shows a total of 171 effective Members (including many foreigners, of whom, however, only six are our own countrymen), twelve Honorary Members (including Messrs. Stainton and Westwood), with the addition of Corresponding and Associate Members. It had also at that time acquired the distinction of being recognised by the State and of receiving a certain amount of State aid.

On October 18, 1880, the Society celebrated its twenty-fifth anniversary, rejoicing in the attainment of more than its majority, on which occasion the present President (M. Weinmann) read a short congratulatory address, and the indefatigable secretary (M. Preudhomme de Borre, to whom the Society owes much of its recent success) gave an instructive sketch of the history and progress of the Society. On that occasion an especial honour was bestowed upon its first president, Baron de Selys-Longchamps (recently elected President of the Belgian Senate), by conferring upon him (in spite of his protestations) the title of Honorary President, a graceful tribute to one who for so long had continually used his energies, his social and scientific position, and his purse in furthering its interests.

Even apart from purely scientific considerations, the history of Belgium is so indissolubly mixed up with our own, and the feeling of fraternity so close, that all students of entomology in this country cannot but reciprocate the mutual congratulations that passed on this occasion between the native members; and the hearty and unaffected demonstrations of friendship accorded to our own entomologists who have attended the meetings of the Society show how warmly they welcome those of the foreign members who occasionally visit Brussels. The meetings are held in a room in the Royal Natural History Museum, in which is the library, and in connection with the entomological collection of the Museum. The annual subscription is small, and entitles the members to receive all the publications, including elaborate separate reports of the proceedings at the monthly meetings. We hope soon to see Englishmen figuring far more numerously in the lists of members.

R. McL.

A GENERAL THEOREM IN KINEMATICS

THE following theorem with regard to the motion of a rigid body will doubtless be interesting to mathematical physicists:—

In all cases of the motion, parallel to one plane, of a rigid body there is at every instant a point, J, of no acceleration, in the plane of motion; the acceleration of every point, P, in the plane is in magnitude directly proportional to the distance, JP; and its direction makes with JP an angle which, though varying with the time, is at any instant the same for all points in the body.

If ω is the angular velocity of the body at any instant and $\dot{\omega}$ the angular acceleration, the angle between JP and the direction of acceleration of P is

$$\tan^{-1}\frac{\dot{\omega}}{\omega^2}.$$

We have therefore in all cases of uniplanar motion of a solid body an *instantaneous acceleration centre*, which is analogous to the ordinary instantaneous [velocity] centre.

Of course the ordinary equation

$$I\dot{\omega} = L,$$

which holds for motion round an axis fixed in space and in the body, and which expresses that the moment of the external forces about the axis is equal to the moment of the forces of inertia, holds also for the instantaneous acceleration centre.

As a particular case, whenever a solid moves with constant angular velocity, the accelerations are all directed towards the same point at any instant, and it follows that the resultant stress exerted over the surface of any little lump of the matter is a force directed to this point, if no continuous forces act.

This centre can be in any case geometrically constructed by a rule analogous to that for the ordinary instantaneous centre.

When I had hit upon this theorem I mentioned it to Prof. Wolstenholme, who at once looked out for its extension to three dimensional motion. The result is very simple.

In all cases of the motion of a solid body there is at every instant a point, J, of no acceleration; and if at J there be drawn two axes, JA and JB, which are those respectively round which the resultant angular velocity, ω, and the resultant angular acceleration, $\dot{\omega}$, take place, the acceleration of any point, P, is compounded of two—one along the perpendicular, p, from P on JA, and the other perpendicular to JB and to the perpendicular, q, from P on JB, these two components being, respectively,

$$\omega^2 p \text{ and } \dot{\omega} q.$$

It seems surprising that such a simple and general property of the motion of a rigid body should not have been well known long ago.

GEORGE M. MINCHIN

Royal Indian Engineering College,
Cooper's Hill, November 6

NOTES

THE awards of medals for the present year made by the President and Council of the Royal Society are as follows:—The Copley Medal to Prof. James Joseph Sylvester, F.R.S., for his long-continued investigations and discoveries in mathematics; a Royal Medal to Prof. Joseph Lister, F.R.S., for his contributions on various physiological and biological subjects published in the Philosophical *Transactions* and *Proceedings* of the Royal

Society and elsewhere, and for his labours, practical and theoretical, on questions relating to the antiseptic system of treatment in surgery; a Royal Medal to Capt. Andrew Noble, F.R.S., for his researches (jointly with Mr. Abel) into the action of explosives, his invention of the chronoscope, and other mathematical and physical inquiries; the Rumford Medal to Dr. William Huggins, F.R.S., for his important researches in astronomical spectroscopy, and especially for his determination of the radial component of the proper motions of stars; the Davy medal to Prof. Charles Friedel of Paris for his researches on the organic compounds of silicon, and other investigations.

WE regret to have to record the death of M. d'Almeïda, secretary of the French Société de Physique, and editor of the *Journal de Physique*. M. d'Almeïda published a "Traité de Physique" in collaboration with M. Boutin. The *Comptes rendus* of the Academy of Sciences contain a number of his memoirs.

MR. SPOTTISWOODE, president of the Royal Society, was present at the sitting of the French Academy of Sciences on the 15th inst. He witnessed experiments made at Meritens' workshop on the magneto-electric engines which have been ordered by the Trinity House. The trials were successful.

SIR EDWARD REED writes from Corunna to the *Times* of yesterday, pointing out, as we were able to do last week, that the reports as to the injury sustained by the *Livadia* have been greatly exaggerated, and were not more than a few Clyde shipwrights could have repaired in a couple of days. There was no difficulty in getting the two injured compartments put to rights, barring the laziness of the French shipwrights. The *Livadia* returns to Ferrol for the winter, as her services are not required by her Imperial owner.

FURTHER details concerning the earthquake in Austria on the 9th confirm the reports as to its extent and severity. At Agram there were three shocks—the first, at 7.24 a.m., was the most formidable and lasted ten seconds; the second, also severe, occurred at 7.30; while the third, which was much the weakest, took place at 8.28 a.m. The first shock is described as circular. It was followed by violent oscillations from north-north-east to south-south-west. After it the whole town was covered by a dense cloud of dust caused by the falling down of chimneys, walls, and houses in every direction. From Laibach, Marburg, Klagenfurt, Kanizsa, Serajevo, Derwent, Brod, Pola, Trieste, Cilli, and the region of the river Drave, intelligence has been received of more or less severe shocks about the time of the first great shock in Agram. The earthquake was also felt in both Vienna and Pesth, but so slightly that it attracted the notice of only a few persons. The direction of the motion was everywhere the same, from north-east to south-south west. As far as can be judged from the information hitherto received, the movement extended from the 44th to the 48th degree north latitude, and from the 32d to the 37th degree of east longitude (Ferro). From almost every district on the right bank of the Danube there is news of a greater or less disturbance with more or less damage done, while from the other side there is no such intelligence from even a single place. It was also felt at Szegedin and on the Theiss. Slight shocks were also felt on the night of the 9th and morning of the 10th, at Agram, and at noon on the 11th, a shock caused a number of houses to fall; the last was preceded by slighter shocks at 5.30 and 11 a.m. The disturbance was continued on the evening of the 11th, and on the morning, afternoon, and evening of the 12th. In the neighbourhood of Agram two mud volcanoes are said to be formed and in full eruption, and several hot springs have risen. The earth has also been rent in many places in the open country, and considerable quantities of mud with hot water and sulphur have been thrown out. The Vienna correspondent of the *Times* writes under the date of November 14: "The earth has been rent in many places in the open country, and considerable quantities of mud and hot water with sulphur have been thrown out. One of the largest of these rents is near the village of Resnik. Agram has often been visited by these earthquakes, especially within the last few years. Indeed scarcely a year has passed without more or less violent shocks." On the night of the 15th–16th there were at least five shocks at intervals between midnight and 4 a.m. Geologists have gone from Vienna and Berlin to Agram to study the phenomena more closely.

MR. J. MUNRO has drawn our attention to the fact that in NATURE, vol. xviii. p. 169, there appeared a short letter signed "J. F. W." and dated from Kew, June 3, 1878, suggesting the principle of Prof. Bell's photophone. The letter is as follows:—"Till now I have looked in vain for any account in NATURE of experiments with the telephone or phonoscope, inserted in the circuit of a selenium (galvanic) element (see NATURE, vol. xvii. p. 312). One is inclined to think that by exposing the selenium to light, the intensity of which is subject to rapid changes, sound may be produced in the phonoscope. Probably by making use of selenium, instead of the tube-transmitter with charcoal, &c., of Prof. Hughes, and by exposing it to light as above, the same result may be obtained. I should be glad to know whether experiments have been made in this direction; for if the above should prove true, there is no doubt that many applications would be the result."

OUR entomological readers will be glad to know that Mr. McLachlan will still continue his valuable services to the *Zoological Record*, reporting as usual on the groups of the Neuroptera and Orthoptera. Mr. Rye will henceforth confine himself to editorial work, while the groups hitherto recorded by him will be undertaken by Mr. Kirby, who will also do the Coleoptera.

LARGE additions are now being made to the Muséum d'Histoire Naturelle in the Jardin des Plantes at Paris. A new front is being erected and two new sides, which, combined with the former "Galerie," will form a hollow square. This square will be covered with glass and used for the exhibition of skeletons of whales and other specimens of inordinate dimensions. The total cost of these buildings is estimated at five million francs (160,000*l.*).

UNDER the auspices of the Russian Geographical Society M. Merejkovsky has been investigating the prehistoric anthropology of the Crimea. He has explored numerous caverns and made large collections of skulls, and the conclusion he comes to is that the age of stone in the Crimea may be divided into three periods: 1. Diluvian period, with mammoth fauna and arms of large dimensions, rudely worked. 2. Alluvial period, with contemporaneous fauna and the use of the arrow. 3. A later period, remarkable for the use of stone arrows, with scarcely any arms of large dimensions. In the Ural M. Malakhof has obtained important results, both geodetical and anthropological. He believes he has discovered on the Neïva, 75 versts from Ekaterineborg, traces of a prehistoric city.

A REGULAR analysis of the air is carried on by M. Davy at Montsouris. It has been found that the number of bacteria was twice greater than usual during the last period of high mortality.

THE President of the French Republic has established telephonic communication between the Elysée and the Chamber of Deputies, as well as the Senate. The first message of this instrument was the intelligence that the Cabinet had been placed in a minority.

AN interesting exhibition took place on Sunday, the 14th, at the Paris Conservatoire des Arts et Métiers, Rue St. Martin. The *portefeuille* of Vaucauson was opened for the first time to public inspection. On this occasion the most important documents of this collection were affixed to the walls, with a number of other articles belonging to the archives. The most interesting is certainly the original letter written by Fulton to Mollard explaining to him the principles of steamboat construction. The letter is very long and exhaustive, and is accompanied by a drawing. M. Mollard returned a very cold answer after having meditated for a full month, and he says that "Mr. Fulton's communication will be lodged in the archives of the Conservatoire." The date of Fulton's communication is the beginning of Pluviose, An. 11; Mollard's answer is not exhibited, but has been seen by our correspondent.

The Jablochkoff light has been introduced by M. Hervé-Mangon into the Conservatoire. It will be fed by a Gramme machine, which the establishment has purchased for its constant use. The light will be placed in the amphitheatre, where M. Hervé-Mangon delivers, twice a week, his own lectures.

The lighting of the Victoria Station of the District Railway by means of the Jablochkoff electric light has been so successful that it has been also applied to the Charing Cross Station, and will shortly be introduced at Earl's Court.

M. Martin is engaged in polishing the object-glass of the large refracting telescope now building at the Paris Observatory. The diameter of this exceptional lens is 73 centimetres, and its weight 200 kilograms. The quality of the glass having proved defective it has already broken twice, and the operation is now being made on the third casting.

On the occasion of the opening of the Ronalds Library at the Society of Telegraph Engineers, a considerable number of rare and curious books relating to electricity, magnetism, navigation, &c., was exhibited. A list of these has been printed and would be valuable to any one interested in the history of the departments of science concerned.

A good example of the thoroughness of German education is given in the publication by Brockhaus of Leipzig of an "English Scientific Reader," edited by Dr. F. J. Wershoven, its purpose being to familiarise students with the style and terms used by the best English scientific writers. The first part relates to physics, chemistry, and chemical technology, and the extracts are made with great judgment. Among the authors from whom selections are made are Clerk-Maxwell, Fleeming Jenkin, Crookes, Roscoe, Lockyer, Rankine, Bloxam, George Wilson.

We have received the first two volumes of a new "Bibliothèque Belge," for the popularisation of the sciences and arts, published at Mons by Manceaux. The two volumes received are "Traité élémentaire de Météorologie," by MM. J. C. Houzeau and A. Lancaster, two names well known in connection with this subject; and "Zoologie élémentaire," by Prof. Felix Plateau, whose name must also be familiar to our readers in connection with original research in a special department of the subject. Both volumes are well printed and illustrated. Among the volumes to follow are "Palæontology and Conchology," by A. Briart; "Geology," by F. Cornet; "Botany," by F. Crépin; "Mineralogy," and "Mineral Physiology," by L. L. de Koninck; "Mechanics," by H. Hubert; "Astronomy," by M. Niesten; "The Beginnings of Animal Life," by E. van Beneden; and "Physics," by vand der Mensbrugghen.

Prof. Cornelius Doelter of Gratz was to proceed on the 15th inst. to Paris, thence to set out on a mission of scientific investigation to West Africa.

According to official reports of the statistics of Bosnia and Herzegovina, these contain 1272 parishes, 43 towns, 31 markets, 5042 villages, 189,662 houses, 200,747 dwellings. Of the 1,158,440 inhabitants 607,789 are male, 550,681 female, 448,613 Mahommetan confession, 496,761 Greek-Oriental, 209,391 Roman Catholic, 3426 Jewish, 249 other confessions.

The Procureur-General of Paris having complained, in his official address on the occasion of the opening of the courts, that the legal experiments in cases of poison were executed without sufficient precautions being taken against the professional prejudices of the operator, all the medical advisers of the criminal courts in Paris sent in their resignation, after having taken the advice of the Dean of the School of Medicine and other scientific authorities. Their number is nineteen.

A fairly satisfactory Report is given by Surgeon-Major Bidie on the Government Central Museum at Madras. The number of visitors, especially female, continues to increase, and the special arrangements for native ladies attracted an average of 116 on the afternoon of the first Saturday of each month.

The *Garden* has increased its size and reduced its price, introducing several improvements.

Lord Gifford, one of the Scotch judges, in opening the session at the Edinburgh School of Art the other day, summed up very neatly the advantages which a full and accurate scientific knowledge would bestow on those who were engaged in any practical work whatever—(1) That scientific knowledge of their subject would make work, whatever it was, intelligent, not mechanical; (2) it would make their work skilful and easy; (3) it would enable them to produce more exact and perfect work; (4) it would make their work advancing and progressive; and (5) it would make their lifework in itself delightful, and a source of pure and profound joy.

A very favourable Twelfth Report of the Working Men's College is issued. This institution completed its twenty-fifth year last year, and during its existence has doubtless done much good. The science classes have attracted an increasing number of students in recent years.

Under the title of "The Free Libraries of Scotland" some useful information is brought together in a pamphlet by "An Assistant Librarian." The towns in Scotland in which there are free libraries are Airdrie, Dundee, Forfar, Galashiels, Glasgow (Mitchell Library), Hawick, Paisley, Thurso. The University towns of Edinburgh, Aberdeen, and St. Andrews are still without such useful institutions; the Act has been adopted in Inverness and Dunfermline; Arbroath has twice rejected the proposal to adopt the Free Libraries Act.

We are glad to notice that the Highbury Microscopical and Scientific Society is increasing in numbers and has some good papers promised for the new year. It gave its fourth annual *soirée* at Harecourt Hall on October 14, and the president, Mr. Frederick Fitch, F.R.M.S., gave his address on the "History of the Microscope and Microscopic Research" on October 28. On Saturday, the 13th inst., a visit will be paid to the Museum of Practical Geology under the guidance of Prof. Rudler, F.G.S.

In the *Transactions* of the Royal Society of Victoria, April 1880, recently received, the Rev. R. H. Codrington contributes some valuable "Notes on the Customs of Mota, Banks Islands." Since Mr. Tylor in his "Early History of Mankind" so graphically sketched the remarkable custom of the "*couvade*" all information as to its further geographical distribution is ethnologically valuable, and Mr. Codrington here adds the Banks Islands to the area in which it is practised. There is also a tradition that among the inland mountains there is or used to be a race of wild men, which agrees with the stories that are current in most of the Asiatic Islands. The *Mota* practices here described are not to be confounded with those of the *Motu* of New Guinea.

A NEW destructive insect is recorded from America; *Cetonia inda*, a beetle which, according to the *American Naturalist*, was harmless, feeding on the sap of freshly cut maple-trees, has within two or three years become very abundant and destructive in different parts of New England. During the past summer it collected in great numbers on green-corn, "eating the kernels and partly destroying a field in Middleboro, Mass."

FAVOURABLE reports reach us as to the thriving condition of the Botanical Gardens, Peradeniya, Ceylon, under the direction of Dr. Trimen, who recently succeeded Dr. Thwaites. In the experimental nurseries, our contemporary the *Colonies* says, good work was being done. Every effort was being made to extend the cultivation of *Cinchona*, the export of which for the season, up to the date of latest advices, had been 1,135,236 lb. In the district of Kotmale report represented the india-rubber tree as flourishing, and the export of its valuable juice from the colony may, it is hoped, be eventually looked upon for supplementing the falling off in export of this valuable article from the forests where it is indigenous.

THE *Colonies and India* draws attention to the riches of the New Zealand forests in their indigenous timbers. Though the woods of New Zealand, like those of Australia, are by no means unknown in this country, owing to the assistance afforded for making their acquaintance through the various International Exhibitions, they are nevertheless almost unknown in commerce in consequence of their extreme hardness and the cost of freight in bringing such heavy material so long a distance. Our contemporary thinks that the timbers "will become of much greater value when it is more generally known when to cut and how to season them." We are told that experiments in this direction are being made in order to test their value for various purposes. Several of the best woods are enumerated, and it is said of the "Matai" (*Podocarpus spicata*) that Mr. Buchanan "reports having found a tree of this species prostrate on a piece of land near Dunedin, which from various circumstances was estimated to have been exposed for at least three hundred years in a dense damp bush under conditions most favourable to decay. It was still however sound and fresh."

MAMMEE APPLES (*Mammea americana*) are, we understand, being exported in quantities from the West Indies to New York. The result of the experiment is being watched with some interest.

IN the last number of the *Revue d'Anthropologie* has appeared not only an excellent photograph of the late Dr. Paul Broca, but also a biographical sketch and a complete list of his various contributions to science. His contributions to medical science commence in 1847, and his first anthropological memoir bears date 1850; from these dates to the time of his death this "Bibliographie" is a record of both untiring industry and scientific production, which will be remembered as long as anthropology remains a science.

OUR ASTRONOMICAL COLUMN

THE SOLAR ECLIPSE OF DECEMBER 31.—Although the eclipse of the sun on the last day of the present year will not in any part of these islands amount to six-tenths of the sun's diameter, it is nevertheless as large a one as will be visible until May 28, 1900, and only that on the morning of June 17, 1890, will compare with it in magnitude in the interval. The *Nautical Almanac* furnishes the results of direct calculations for Greenwich, Edinburgh, Dublin, Cambridge, Oxford, and Liverpool. If to the results for the former three observatories we apply the very convenient Littröw-Woolhouse method of distributing the predictions, we shall have the following formulæ for finding Greenwich mean times of first contact, greatest phase and last contact, and the magnitude of the eclipse at any place within or near to the area comprised:—

h. m.
First contact = 1 41·14 − [9·9891] L + [9·6113] M
Greatest phase = 2 36·32 − [9·7942] L + [9·3838] M
Last contact = 3 28·63 − [9·4618] L + [8·7599] M

Where the latitude of the place is put = 50° + L, and M is the longitude from Greenwich in minutes of time reckoned positive to the east, and negative to the west. Quantities in square brackets are logarithms.

Or the following may be substituted with sufficient accuracy, the factors of L and M being now numbers:—

h. m.
First contact ... ... = 1 41·14 − 0·98 L + 0·41 M
Greatest phase ... = 2 36·32 − 0·62 L + 0·24 M
Last contact ... ... = 3 28·63 − 0·29 L + 0·06 M

and the magnitude will be = 0·368 + 0·013 L − 0·002 M. If we test these formulæ upon Oxford, the latitude of which is 51° 45′ 36″, longitude 5m. 2·6s. W., we have then L = + 1·76°, and M = − 5·04m; then for first contact the expression becomes 1h. 41·14m. + 1·76 × − 0·98 − 5·04m. × 0·41 = 1h. 41·14m. − 1·72m. − 2·07m. = 1h. 37·35m. Greenwich mean time, or applying the longitude − 5·04m. = 1h. 32·3m. agreeing with the *Nautical Almanac*, and similarly for the other phases. The differences from direct calculations will be within 0·2m., if the place is not too distant.

THE DUNECHT COMET.—There appears to be no doubt now that the comet discovered by Mr. Lohse at Lord Lindsay's Observatory on November 7 is the same as that detected by Mr. Lewis Swift at Rochester, N.Y., on October 11, which had not been previously observed in Europe. The elements, according to the calculations of Mr. S. C. Chandler, jun., of Boston, U.S., and those of Dr. Copeland and Mr. Lohse at Dunecht, have great resemblance to the elements of the third comet of 1869, discovered by M. Tempel, and there seems a probability that he may thus be found to have detected no fewer than four comets of comparatively short period. If the revolution of this comet should prove to be performed in a little less than eleven years it will be found that it must approach very near to the orbit of Mars shortly before the descending node, and, which is of more importance, within 0·4 of the earth's mean distance, from the orbit of Jupiter in about heliocentric longitude 257°. Mr. Chandler sends us elements calculated from approximate positions on October 21, 25, 28, and in his letter dated November 2 points out their great similarity to those of the Comet 1869 III., and in a circular received from Lord Lindsay we find an orbit computed from Dunecht observations on November 7, 9, and 10; we have thus for comparison:

	Comet of 1880.		Comet of 1869.
	Chandler.	Copeland and Lohse.	Bruhns.
T ...	Nov. 7·714 ...	Nov. 6·6127	Nov. 20·7168
	° ′	° ′ ″	° ′ ″
π ...	41 41·0 ...	40 24 10	41 17 13
Node ...	295 25·4 ...	300 49 41	292 40 29
i ...	7 21·7 ...	7 22 13	6 55 0
Log. *q* ...	0·04262 ...	0·043314	0·042416
Motion.	Direct.	Direct.	Direct.

Mr. Chandler's T is for meridian of Washington, the other two for that of Greenwich. An ephemeris which he adds proves the identity of Swift's comet with that found by Mr. Lohse.

It may be remarked that, taken as a whole, there is a distant resemblance to the elements of the comet of Biela.

INTRODUCTORY LECTURE TO THE COURSE OF METALLURGY AT THE ROYAL SCHOOL OF MINES[1]

THE distinguished metallurgist who has held this lecturership since the foundation of the Royal School of Mines, concluded the introductory lecture he delivered more than a quarter of a century ago[2] by pointing out to the students who were then beginning their course that "in proportion to the success with which the metallurgic art is practised in this country will the interests of the whole population, directly or indirectly, in no inconsiderable degree be promoted." This is a fact that none of his students are likely to forget.

Looking back on the actual advance of this country during the

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[1] By Prof. W. Chandler Roberts, F.R.S., Chemist of the Mint. Condensed by the Author.

[2] *Records* of the School of Mines, vol. i. pt. 1 (1852) p. 127.